Overweight and Obesity Among Early Adolescent School Girls in Urban Area of West Bengal, India: Prevalence Assessment Using Different Reference Standards

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ABSTRACT

Background: Overweight and obesity are epidemic and a 'public health crisis' among adolescents worldwide. The rising trends in adolescent obesity in girl are poorly documented in India. The aim of this study was to compare and assess the extent of overweight and obesity in early adolescent school girls using three references [World Health Organization (WHO) 2007; the Center for Diseases Control (CDC) 2000 and the International Obesity Task Force (IOTF) 2000].

Methods: A cross sectional study was designed in 1375 early adolescent girl (10-14 years), in five Government affiliated schools of Kharagpur Municipality of West Bengal, India.

Results: Results of this study are eloquent of the fact that the roots of obesity lies in early stage of adolescence. Incidence of overweight, including obesity of participants was 10.62%, 7.64% and 7.49% depending on the references used (WHO, CDC and IOTF) respectively. Both incidence and remission rates were higher among younger girls.

Conclusions: Regarding the harmful ramifications of overweight and obesity, it is encourage to healthy eating patterns and increase physical activity among early adolescent girls.

Keywords: Body mass index, early adolescent, obesity, overweight, school girl, West Bengal

INTRODUCTION

In recent decades, the prevalence of obesity in children and adolescent has risen steeply world wide.[1] A high prevalence of adolescence obesity and overweight cases has been reported in developing countries undergoing nutritional transition.[2] These are emerging as a major public health problem in India also.[3-8]

Early stage of adolescent is characterized by an exceptionally rapid rate of growth and is often variable in individuals due to its dependence on genetic hormonal and nutritional factors.[4] Obesity in children and adolescents is a serious issue not only because of the health consequences in childhood and adolescence

but also because of the greater risk of obesity in adulthood.[4,9] Epidemiological literature shows that about one-third of obese pre-school children and about one-half of obese school age children become obese adults.[3] Obesity is associated with significant comorbidities and health problems such as diabetes mellitus, hypertension, coronary artery disease, orthopedic problems, along with other problems such as impaired quality of life and negative self-esteem.[10]

However, it has recently been estimated that the prevalence of obesity in adolescent girl is increasing, most of these studies either targeted school children or comprised small non-representative samples from large cities[3-6] and information regarding early adolescent girls in small town in India is scarce. Overweight and obesity among early adolescent school girl is a growing health concern in West Bengal too[7,8]; the consequences of which can cause disaster to our future generation. There is a paucity of nationwide data on prevalence of overweight and obesity in early adolescent girls.[5,7]

Several methods have been created in order to measure body fat and obesity during childhood and adolescence. Body mass index (BMI) is the preferred method of expressing body fat percentile in groups.[11] To this date, three major reference charts are being utilized. These are the Center for Diseases Control (CDC) growth charts,[12] the WHO 2007 references[13] and the International Obesity Task Force (IOTF) reference.[14] Earlier studies from India have not documented the prevalence of obesity in adolescent girls by using three references. This study was, therefore, conducted to assess the prevalence of overweight, obesity in early adolescent school girls in Kharagpur Municipalities of West Bengal, India. An additional goals was to compare the performance of three references (WHO, CDC and IOTF).

METHODS

Study area
The school based cross-sectional study was conducted among early adolescent girls studying in 6th to 8th standard (10-14 years old) of five Government approved secondary schools of Kharagpur Municipality, from September 2010 to January 2011. We adopted a simple random sampling procedure for the selection of the schools.

Kharagpur small industrial town is located at 22°19'44" N, 87°19'05" E and covering an area of about 30 km². It is about 125 km away from of Kolkata, the provincial capital of West Bengal, India. Kharagpur acquires unique place in Indian as town of mixed ethnicity and linguistic diversity. As per 2001 Indian census total inhabitants were 207984, where 48% were female.

Profile of the subjects
These schools had a substantial number of students belonging to Bengali Hindu, Bengali Muslims and Telagas. As per the registers available with the schools, 1486 children in the defined age group were enrolled. A total of 1379 school children were present during the visit and full information was available for 1375 students. Thus, 92.53% of the enrolled school children were examined for height and weight.

Anthropometric measurements
The height and weight measurements were made and recorded following the standard techniques.[15] Height and weight were measured using anthropometric rod and weighing scale to the nearest of 0.1 cm and 0.5 kg, respectively. The weighing scales were calibrated daily against standard weight. Technical errors of measurements (TEM) were computed and they were found to be within acceptable limits. BMI was computed using the following standard equation: BMI = Weight in kg/height squared in meter.

Definitions
Overweight and obesity were defined on BMI cutoff points, which are gender and age specific. (i) for the CDC growth charts the BMI cut-off points are 85th and 95th percentiles for overweight and obesity respectively; (ii) the IOTF reference is based on the BMI of 25 and 30 at the age of 18 for classification of childhood and adolescent overweight and obesity, respectively; (iii) for the WHO reference, percentiles expressed in Z scores determine the cut-off points for overweight and obesity at 85th and 98th percentiles, or +1 SD and +2 SD, respectively.

Ethical consideration
Parents, teachers and the girls in the selected schools were well-informed on the scope and extent of the survey and consent of the parents were also obtained.

RESULTS

A total of 1375 girls completed the study and analyzed. The mean values (±SD) of weight, height, and calculated BMI in relation to age are shown in Table 1. Weight, height and BMI increased with advancement of age.

The prevalence of overweight and obesity for early adolescent girl according to age are shown in Table 2. The prevalence of overweight, including obesity of the subjects was 10.62%, 7.64% and 7.49% depending on the references used (WHO, CDC and IOTF, respectively). Prevalence of obesity was 2.25%, 1.74% and 1.31%, respectively. Both the extents of overweight and obesity were highest at 14 years of age. An interesting observation made was that the overall prevalence of overweight was increased with age. The higher prevalence of overweight and obesity observed in our subjects using the WHO 2007 reference. Where CDC and IOTF reference are depicted similar frequency of overweight and obesity for girl aged 10-14 years.

Table 1: Mean (±SD) of height, weight and BMI of early adolescent girl

Age (years)	N	Height (cm) mean±SD	Weight (kg) mean±SD	BMI (kg/m²) mean±SD
10	304	131.87±9.2	27.12±6.38	15.47±2.55
11	351	136.93±8.99	29.74±6.83	15.73±2.5
12	328	141.1±8.78	33.22±7.53	16.59±2.84
13	309	146.24±6.95	37.36±7.39	17.35±2.71
14	83	148.67±6.96	42.71±8.35	19.26±3.14
Overall mean		139.62±10.11	32.48±8.41	16.45±2.86

BMI=Body mass index

DISCUSSION

Overweight and obesity are now a global health problem, so much so that a new word '*globesity*' has been coined which refers to the universal health burden of obesity.[16] One-third of all deaths globally, already stem from ailments linked to excess weight. A dramatic increase in the prevalence of adolescent obesity has occurred in most parts of the world[2,9,11,17] and it has also been demonstrated in Indian school-aged adolescent girls.[3,4,5,7]

In the present study, three newly developed BMI based references were used to compare the overweight and obesity. The results demonstrated that overall prevalence of overweight amongst the early adolescent school girls were 10.62%, 7.64% and 7.49%, respectively, according to the WHO, CDC and IOTF references values. Similarly, the higher extent of obesity was mostly accounted using WHO references (2.25%), where CDC (1.74%) and IOTF (1.31%) values were low range. These differences are due to the methods used to build the various references and influenced by the BMI distribution in a study population. Study also depicted that prevalence values were slightly higher in CDC reference compared to IOTF reference. Previous studies Argentina[2] and USA[18] also demonstrated that the CDC reference generates a slightly higher estimate than that of the IOTF. These differences affect the level of the cut-offs and consequently the prevalence calculated using these different cutoffs.[2] Both, overweight and obesity were observed higher in 14 years old girls in all growth charts. These data also provide an indication that the prevalence of overweight was higher in our study areas which is suggestive of the obesity epidemic in 21st century.

Table 2: Prevalence of obesity, overweight (WHO, CDC and IOTF) among early adolescent girl

	Reference	Cut-off values	Prevalence (%)					Overall
Age			10	11	12	13	14	
N			304	351	328	309	83	
Obesity	WHO[a]	+2 SD	3.29	2.28	2.13	1.62	3.61	2.25
	CDC[b]	95th	1.96	1.71	1.52	1.62	2.4	1.74
	IOTF[c]	30	1.32	1.14	1.52	0.97	2.4	1.31
Overweight	WHO[a]	+1 SD	11.84	9.4	9.76	10.32	15.66	10.62
	CDC[b]	85th	7.57	7.41	7.32	7.12	12.05	7.64
	IOTF[c]	25	7.57	7.7	7.01	6.47	12.05	7.49

[a]WHO reference cut-off values at +1 SD and +2 SD for age wise overweight and obesity, respectively, [b]CDC reference cut-off values at 95th and 85th percentiles of BMI by age for obesity and overweight, respectively, [c]IOTF reference cut-off values defined over BMI 30 and 25 kg/m² at the age of 18 for obesity and overweight, respectively, WHO=World Health Organization, CDC=Center for diseases control, IOTF=International obesity task force

Recent evidence suggests that the nutrition transition is accelerating in India and the outcome of this trend is a rapid increase in obesity and chronic diseases.[2,8] School based data in India showed the extent of overweight is much in early adolescents.[4,5,8] A study in urban areas of India (WHO criterion used) showed that overweight and obesity among early adolescent school girls was 12.9% and 9.9%, respectively.[6] Bose *et al*.[7] reported that the extent of overweight and obesity was 17.63% and 5.10% among affluent *Bengalee* school girls. This probably accounted for the better nutrition of the affluent girl. All these studies used either WHO references or IOTF reference cut off point for assessment of overweight and obesity. Recently, similar study by Kovalakys *et al*.[2] at Buenos Aires observed higher prevalence of obesity using WHO references than other references.

But the prevalence of obesity was higher than those of children of the same age groups in developed countries.[2] Where Iranian[9] (CDC cut-off values) and Tanzanian[17] (Z score) female adolescents were 1.8% and 3.9% obese, this disparity in the prevalence of overweight between the two areas could be due to the level of socio-economic differences. However, our data are also concordant with results of a study in Midnapore Town of West Bengal, this might be due to same socio-economic status.[8] Lifestyle transition and socio-economic improvement have contributed enormously to the escalating problem in developing countries.[17] Lack of health awareness to both parents and children may also be linked to its high prevalence.[18]

The references used in this study produce different estimates for overweight and obesity. However, future research is needed to identify more accurate defining criteria for overweight and obesity using the BMI cut-offs in adolescents.

CONCLUSIONS

The study showed that escalating incidence of overweight in early adolescence school girls in small town of our country is a critical health issue. The study suggests that greater risk of overweight among school girls identifies a group for targeted intervention that promotes increased physical activity and decreased consumption of energy dense foods to control the escalating prevalence which ameliorate our future generations.

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